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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/718,832

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Y. Long He

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FISH & RICHARDSON, PC

P.O. BOX 1022

MINNEAPOLIS, MN 55440-1022

EXAMINER

LUND, JEFFRIE ROBERT

ART UNIT

PAPER NUMBER

1763

DATE MAILED: 09/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/718,832

Applicant(s)

HE ET AL.

Examiner

Jeffrie R. Lund

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 24,25,27-31 and 42-51 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☒ Claim(s) 24,25,27-31 and 42-51 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 49-51 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 49-51 require that "the controller is configured to control the volume ratio of one of the two different types of plasma etchants to the other of the two different types of plasma etchants". The specification requires that the first component be CxFy and the second component be SpFq and the ratio be CxFy to SpFq, not any one reactant to any other reactant.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 24, 25, 27-31, 42, 43, and 45-51 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are directed to a plasma etching apparatus and include process or method limitations such as: "wherein the first and second plasmas have a specified ratio such that a combination of the first and second plasmas would etch a substrate at a

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uniform rate of etching across the substrate, the rate of etching across the substrate to distances of at least 50 mm from a central portion of the substrate being within 1% of the rate of etching at the central portion" (claim 24); the amounts of the first and second plasmas having a specified ratio such that a combination of the first and second plasmas would etch the substrate in the chamber in which the rate of etching across the substrate is within 1% of the rate of etching at a central portion of the substrate" (claim 27); "the rate of etching at a peripheral portion of the surface is within 1% of the rate of etching at a central portion of the surface" (claim 42 and 43); or a combination of the first and second plasmas would etch a substrate at a uniform rate of etching across the substrate, the rate of etching across the substrate to distances at least 50 mm from a central portion of the substrate being within 1% of the rate of etching at the central portion (claim 45). These process limitations render the claims indefinite in that the combination of two separate statutory classes of invention, a manufacturer or seller of the claimed etching apparatus would not know from the claim whether it might also be liable for contributory infringement because a buyer or user of the apparatus later performs the claimed method of using the apparatus (i.e. using the plasma etching apparatus to form a plasmas from CF_4 and SF_6 to etch a substrate using in such a ratio as to uniformly etch a substrate). For example, a manufacture sells a plasma etching apparatus that has all the structural elements of the claimed invention. At the time of sale, during transport and installation, when the machine is off, or at idle the apparatus does not infringe on the claimed invention. The user loads a substrate into the apparatus and supplies CF_4 and SF_6 into the apparatus, the apparatus may or may not

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infringe on the claimed invention depending on how much of which gas is supplied into the chamber. If the ratio is that of the claimed invention, the apparatus infringes on the claimed invention. When the etching is complete and the flow of gas is stopped, the apparatus again does not infringe on the claimed invention. Therefore, given the fact that the apparatus can go from not infringing the claimed invention, to infringing the claimed invention, and back to not infringing the claimed invention in a single use. The apparatus claims are not sufficiently precise to provide competitors with an accurate determination of the metes and bounds of the protection involve, and are ambiguous. (See 77USPQ2D 1140, *IPXL Holdings LLC v. Amazon.com Inc.*)

5. In regard to claim 44 the means plus function does not meet the 3-prong analysis in that the "means for" must not be limited by sufficient structure, material, or acts for achieving specified function (See MPEP 2181). In the instant case the claim defines the act for achieving the function as "the means comprising a first plasma and a second plasma that are derived from different etchant gases, the first and second plasmas having a specified ratio to enable uniform etching of the substrate". The claim has been interpreted to requiring a chamber with a first and second plasma having a ratio.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 24, 25, 27-31, and 42-51 are rejected under 35 U.S.C. 102(b) as anticipated by Jucha et al, US Patent 4,874,723.

Jucha et al teaches a plasma etching apparatus that includes: a chamber 1306; a support 1320 for supporting a wafer (plate) 48; a first high frequency source attached to an electrode 1314; a second high frequency source attached to a remote plasma generator 1326; an inlet structure 1304, 1322; mass flow controllers connected to each gas inlet to control the amount and concentration of the gases supplied to the chamber and controlled by a control system 206. Jucha et al also teaches forming mixed gas plasma containing SF₆ and CF₄. (Entire document, specifically, figure 32, column 51 lines 36-41; and column 64 line 48-51)

The specific amount of CF₄ and SF₆ supplied to the processing chamber to form a specific ratio of the plasmas is an intended use of the apparatus. The apparatus of Jucha et al is capable of supplying the desired amounts of CF₄ and SF₆ to form a mixed plasma such that the rate of etching across the substrate is within 1% of the rate of etching at the central portion of the substrate. Furthermore, it has been held that: claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990); and a

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claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus " if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

8. Claims 24, 25, 27-31, and 42-51 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Applicants disclosed prior art.

After describing the apparatus found in Figure 1 the applicant further discloses that "A suitable plasma chamber apparatus is available as model VRL-ME-II-M-QTZ from Unaxis, St. Petersburg, Florida." (See the specification page 4 lines 13-15) The specific process performed on the specific type of substrate is an intended use of the apparatus. The apparatus disclosed by the Applicant can perform the desired process on the desired substrate as indicated by the Applicant.

9. Claims 24, 25, 27-31, and 42-51 are rejected under 35 U.S.C. 102(e) as anticipated by Hongoh, US Patent 6,343,565 B1.

Hongoh teaches a plasma processing apparatus that includes: a chamber S; a support 24 for supporting a wafer (plate) W; a high frequency source 76; and an inlet structure comprising a first gas supply 54 connected to a first inlet 38 via a first flow controller 46, and a second gas supply 56 connected to a second inlet 40 via a second flow controller 48. (Figure 5)

The particular type of gas used to form a specific plasma is a process limitation rather than an apparatus limitation, and the recitation of a particular type of plasma does not so limit an apparatus claim. This rejection is based on the fact that the apparatus of

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Hongoh is capable of supplying the desired gases at the desired ratio to form the desired ratio of plasmas such that the rate of etching across the substrate is within 1% of the rate of etching at the central portion of the substrate intended by the Applicant. Furthermore, it has been held that: claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); "Apparatus claims cover what a device is, not what a device does" (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus " if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

The only structural limitations claimed is a chamber in which a plasma containing multiple gases is formed and a flow controller to control the flow of the plasma gases. Hongoh teaches such a chamber.

Claims 29-31 deal directly with how the apparatus is used. The limitations are specifically connected to the type of gases supplied and the specific mixture of these gases. The Examiner can find no structure taught by the applicant that directs or controls the gases to achieve these process limitations (i.e. showerhead, baffle) other than the generic gas inlet system. In fact, the only way to achieve these process limitations taught by the Applicant is to use known mass flow controllers to control the mixture or ratio of the gases delivered to a known apparatus.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 24, 25, 27-31, and 42-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jucha et al, 4,874,723 in view of Oda et al, Journal of Vacuum Science & Technology (Nov.-Dec. 1996) vol. 14, no. 6, p. 4366-70 "X-ray mask fabrication technology for 0.1 μ m very large scale integrated circuits".

Jucha et al was discussed above.

Jucha et al differs from the present invention in that Jucha et al does not teach etching a substrate with CF₄ and SF₆ plasmas in a ratio of about 5:1, such that the rate of etching across the substrate to a distance of 50 mm is within 1% of the rate of etching at the central portion of the substrate.

Oda et al teaches etching a substrate using CF₄ and SF₆ plasmas having a ratio of 4:1 (See section III. B. on pages 4367-68). A ratio of 4:1 is about 5:1, and a ratio of about 5:1 will produce an etching rate across the substrate to a distance of 50 mm, within 1% of the rate of etching at the central portion of the substrate.

The motivation for using the ratio of plasmas (about 5:1) in the apparatus of Jucha et al is to optimize and improve the uniformity of the etching process which results in a more uniformly etched substrate as taught by Oda et al. The ratio of plasma gases taught by Oda et al will result in an etching rate across the substrate to a distance

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of 50 mm, within 1% of the rate of etching at the central portion of the substrate.

Furthermore, one of ordinary skill in the art given the teaching of Oda et al that "a little SF₆" improves the etching uniformity, would be motivated to optimize the plasma ratio such that the etching uniformity is optimized. Such optimization is well within the skill of one of ordinary skill in the art, and part of routine experimentation.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the plasma ratio of Oda et al, and use the ratio of Oda et al or optimized ratios in the apparatus of Jucha et al to uniformly etch a substrate.

12. Claims 24, 25, 27-31, 42, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hongoh, 6,343,565 B1 in view of Oda et al, Journal of Vacuum Science & Technology (Nov.-Dec. 1996) vol. 14, no. 6, p. 4366-70 "X-ray mask fabrication technology for 0.1 μ m very large scale integrated circuits".

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The motivation for using the ratio of plasmas (about 5:1) in the apparatus of Hongoh is to optimize and improve the uniformity of the etching process which results in a more uniformly etched substrate as taught by Oda et al. The ratio of plasma gases taught by Oda et al will result in an etching rate across the substrate to a distance of 50 mm, within 1% of the rate of etching at the central portion of the substrate.

Furthermore, one of ordinary skill in the art given the teaching of Oda et al that "a little SF₆" improves the etching uniformity, would be motivated to optimize the plasma ratio such that the etching uniformity is optimized. Such optimization is well within the skill of one of ordinary skill in the art, and part of routine experimentation.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the plasma ratio of Oda et al, and use the ratio of Oda et al or optimized ratios in the apparatus of Hongoh to uniformly etch a substrate.

Response to Arguments

13. Applicant's arguments filed July 10, 2006 have been fully considered but they are not persuasive.

In regard to the argument that the claims of the present application "recites properties of the first and second plasmas not a method of using the plasmas", the Examiner disagrees. The present application is directed to a plasma etching apparatus. The plasmas are a result of the use of the etching apparatus. The claims are rejected because they require the etching apparatus to perform a specific method (i.e. supply CF₄ and SF₆ in a specific ratio and form a plasma from the gases) to generate the specific plasma. Without the specific method of using the etching apparatus the

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plasmas do not exist.

The applicant's arguments are based on the idea that the cited references (Jucha et al, Applicant disclosed prior art, and Hongoh) do not teach the specifics of the claimed plasmas, and that the plasmas are a positively recited limitations, the Examiner agrees. As discussed above, the cited references all teach every structural limitation (chamber, high frequency energy source, gas inlet, controllers) of the present invention. The plasmas are a direct result of the functioning of the apparatus. The reactant gases are supplied to the plasma chamber by a gas supply system with controllers to control the ratio of the reactant gases. The energy sources generate plasma from the reactant gases. Thus, the plasmas are a function of the apparatus, not a part of the apparatus itself. The plasma limitations have been given their proper weight. All the cited references are capable of forming the described plasma.

In regard to the argument that In re Danly, Hewlett-Packard Co. V. Bausch & Lomb Inc., and Ex parte Masham are not relevant to the issue of whether plasmas should be given patentable weight in an apparatus claim, the Examiner disagrees. The cited case law is taken directly from the MPEP and is relevant to the issue. The Applicant has argued that the plasmas have not been given any patentable weight. This is not correct. They have been given weight, in that the apparatus must be capable of forming a plasma. If they were given no weight, then any chamber in any art would be a 102 reference. The cited art are all plasma etching apparatus. The cited case law is particularly important because they are all directed to what defines an apparatus. They define an apparatus in terms of its structure, and not by what it does or works on. As

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discussed above, the function of a plasma processing apparatus is to form a plasma, having specific qualities for a specific function. Therefore, a plasma apparatus must be defined by the structural elements (i.e. chamber, high frequency energy source, gas inlet, controllers) as opposed to what it does (i.e. the specific plasma formed in and by the plasma apparatus).

In regard to the controller of Jucha et al, the controller is configured to control the specific ratio of CF_4 and SF_6 supplied to the processing chamber. The specific ratio is an intended use of the controller. Since Jucha et al is capable of supplying the required ratio of gas to the plasma chamber, the resultant plasma will have all of the benefits and properties of the claimed plasma.

In regard to the arguments that Oda et al does not disclose and would not have suggested how a ratio of the SF_6 and CF_4 plasmas affects uniformity of etching rate, or a specified ratio, the Examiner disagrees. Oda et al was discussed above and teaches that the combination of SF_6 and CF_4 results in a more uniform etch, and further suggests a ratio of 4:1 which is about 5:1 as claimed in the present invention. Thus, the plasmas of Oda et al and the present invention will have the same physical properties.

Conclusion


14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jeffrie R. Lund
Primary Examiner
Art Unit 1763

JRL
9/18/06